

Edwards Aquifer Aquatic Ecosystems

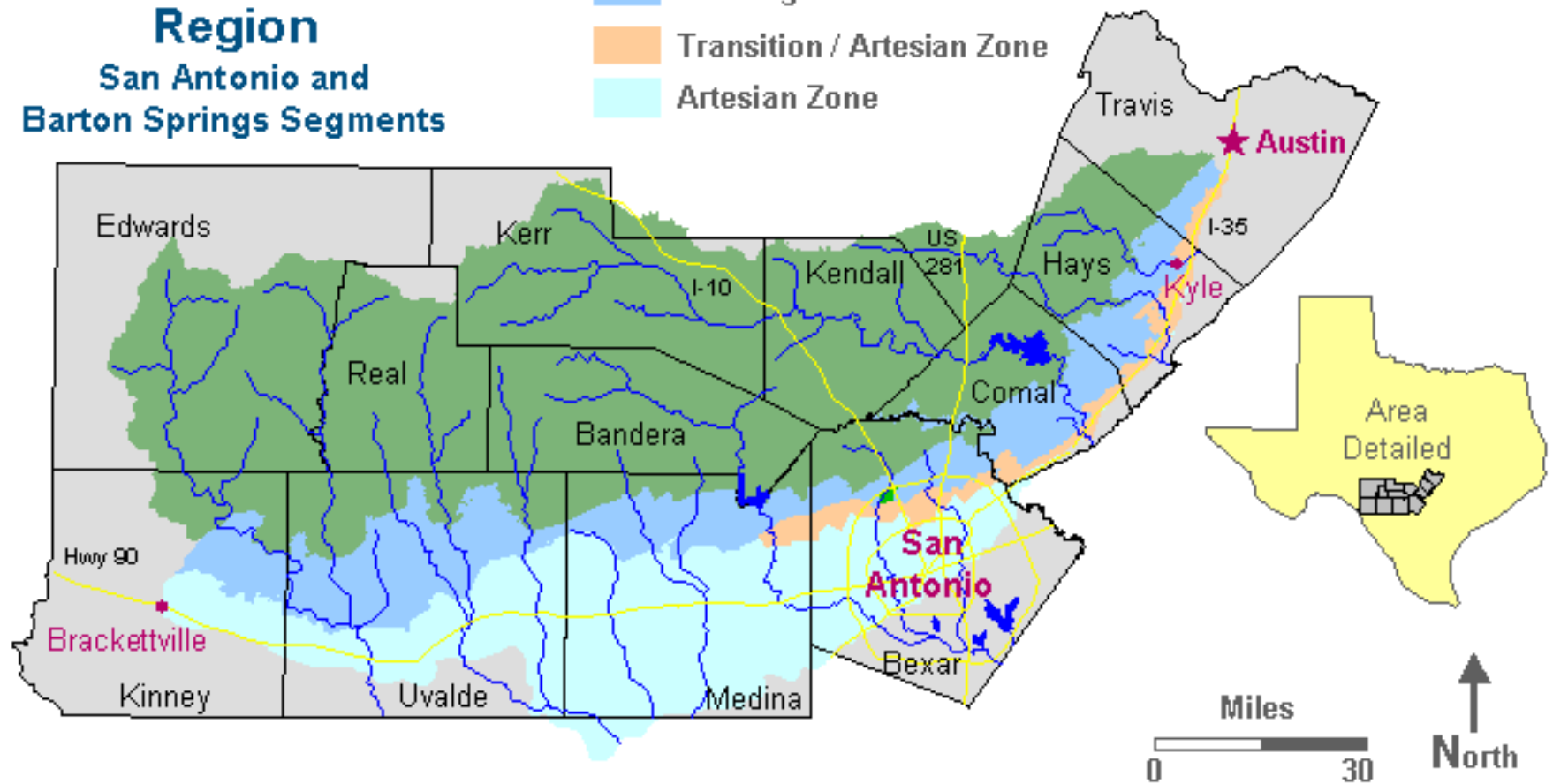
Cindy Loeffler, Chief
Water Resources Branch

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The Edwards Aquifer Region

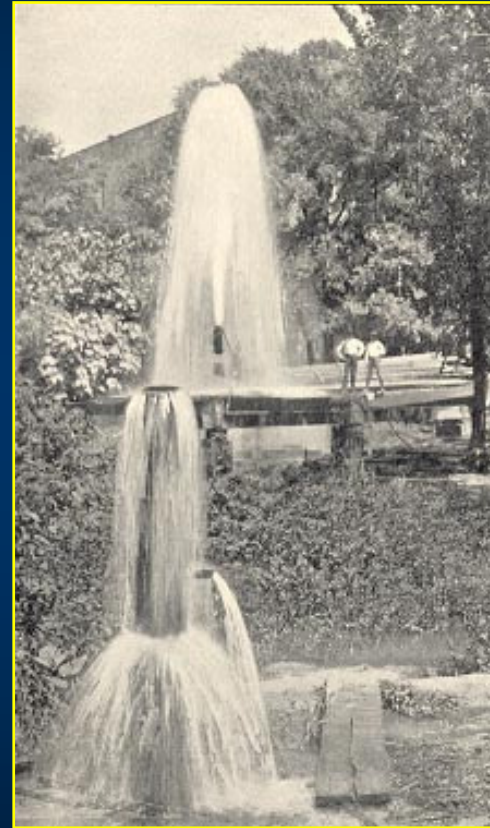
San Antonio and Barton Springs Segments

- Contributing Zone
- Recharge Zone
- Transition / Artesian Zone
- Artesian Zone



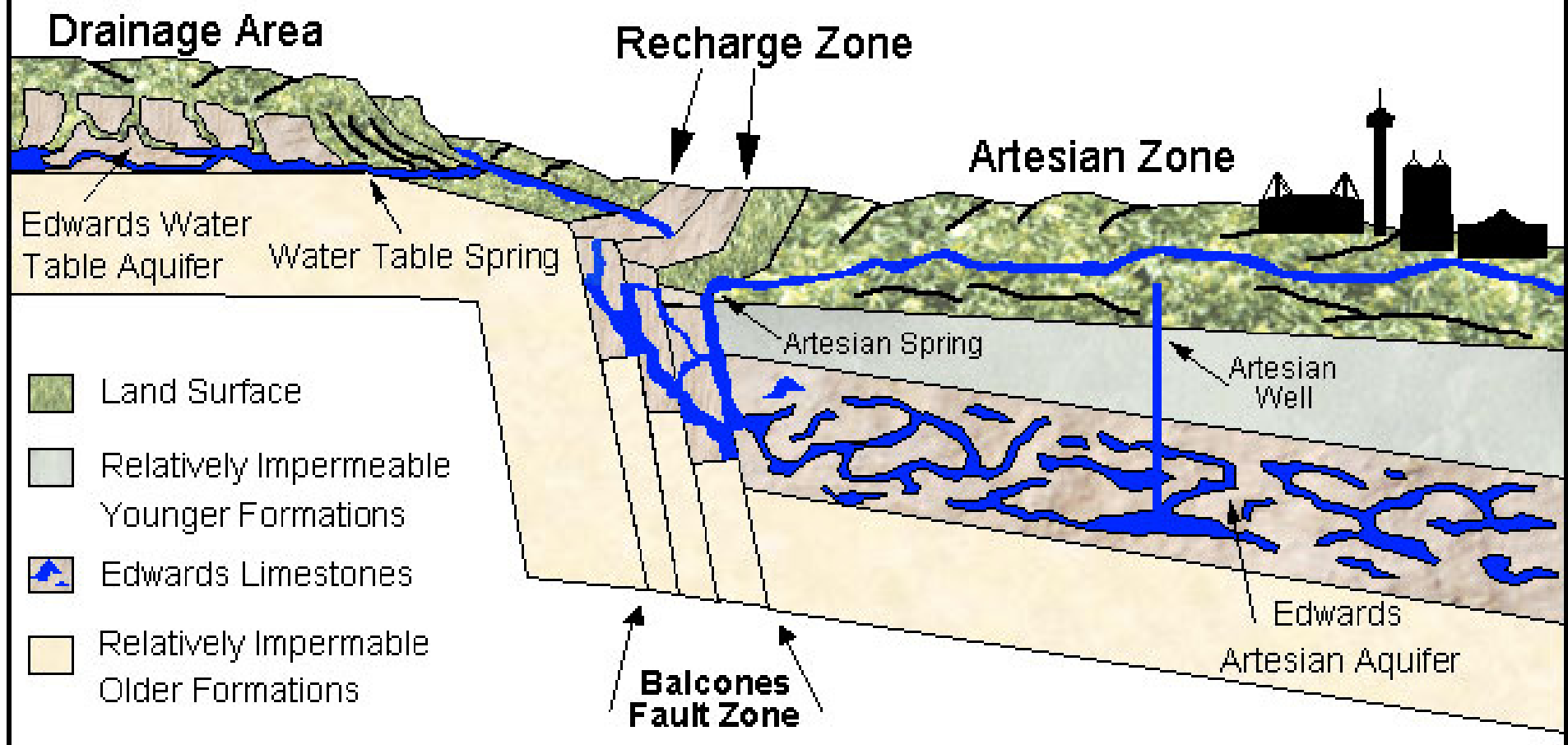
Edwards Aquifer Springs

- Nowhere in the state are springs more important for sustaining aquatic habitats than in the Edwards Plateau Ecoregion
- Highest degree of endemism for animal and plant species in the state – these species found nowhere else
- 15 largest springs in the state issue from the Edwards and associated limestones that underlie the Edwards Plateau Ecoregion. Large springs include San Felipe, Las Moras, San Marcos and Comal Springs



San Antonio Springs

Typical Cross-Section of the Edwards Aquifer Region



Source: Edwards Aquifer Research & Data Center

Importance of Springs and Baseflows



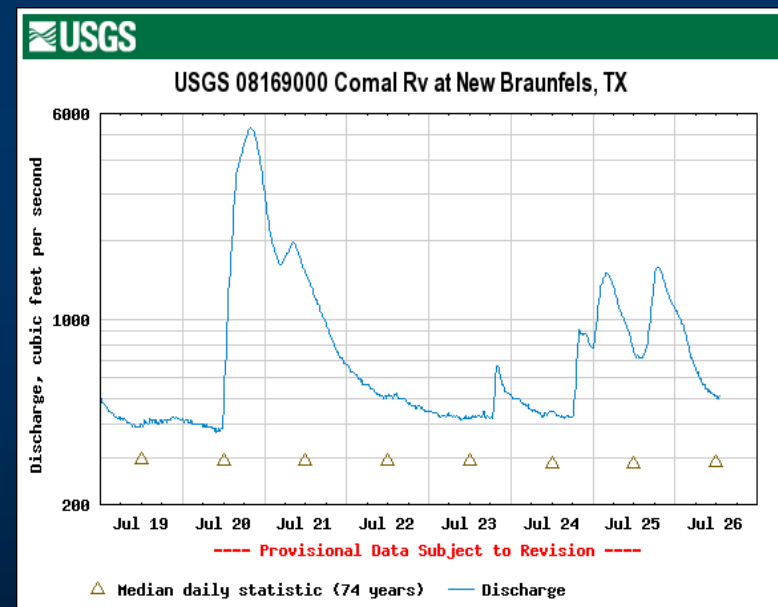
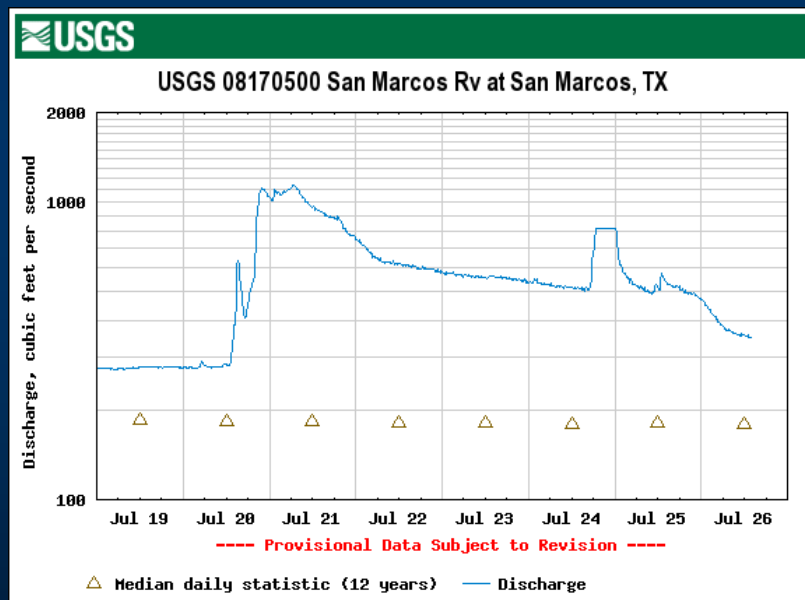
- Springs
 - Support unique aquatic environments, including rare species
 - Serve as a barometer of local aquifer conditions
 - Relatively inexpensive means of monitoring groundwater
 - Provide important baseflows to rivers

- River Baseflows
 - Dependent on aquifer discharge
 - Important component of environmental flow regime, including inflows to bays and estuaries
 - Support habitats during dry periods



Comal and San Marcos Springs

- Two largest springs systems in Texas and home to a number of unique species



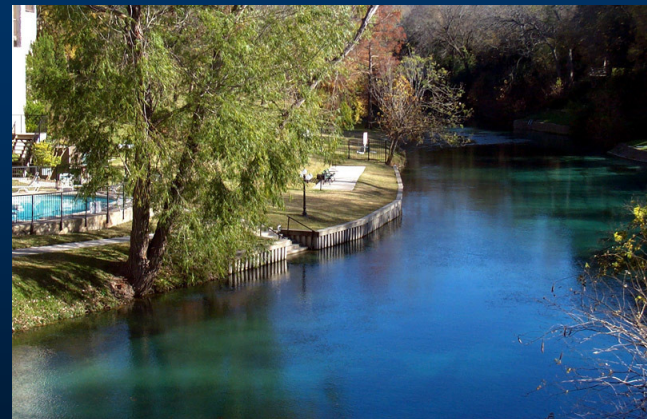
Comal and San Marcos Springs

- Average annual contribution of Comal and San Marcos Springs discharge to the Guadalupe River is 373,000 ac-ft
- Average discharge of the Guadalupe is 1.25 million ac-ft
- Although the contribution of the springs decreases during droughts, the proportion of total flow actually increases



Comal Springs and River

- The Comal Springs are the home of the endangered fountain darter and Comal Springs dryopid and riffle beetles
- Comal River, although only about 2.5 miles long, important recreational resource



San Marcos Springs and River

- San Marcos Springs considered most dependable spring system in the southwestern U.S
- During the drought of the 1950's (Drought of Record), Comal Springs went dry from June to November of 1956 but San Marcos Springs did not go dry
- With expected population growth San Marcos Springs could cease to flow for the first time if we have a severe drought





San Marcos Salamander



Fountain Darter



Texas Blind Salamander

Endangered and Threatened Species of the Edwards Aquifer



Comal Springs Dryopid Beetle



Comal Riffle Beetle



Texas Wildrice



San Marcos Gambusia

Photograph by Bob Edwards



Peck's Cave Amphipod

Photos (except San Marcos Gambusia)
courtesy of Randy Gibson, USFWS

Texas Blind Salamander (*Typhlomolge rathbuni*)

- Adapted for living in water underground - it has no eyes, only two small black dots under the skin
- Active predator - it hunts animal food by sensing water pressure waves created by prey in the still underground waters where it lives
- Depends on a constant supply of clean, cool water from the Edwards Aquifer
- Pollution and overpumping threaten its survival



Photo courtesy of Randy Gibson, USFWS

San Marcos Salamander

(Eurycea nana)

- Occurs only in Spring Lake and an adjacent downstream portion of the upper San Marcos River
- Moss and algae provide hiding places for the salamanders and habitat for small animals that serve as their food
- The dark reddish-brown color of the algae almost perfectly matches the dark color on the back of the San Marcos Salamander
- Clean, clear, flowing water of constant temperature is required for suitable habitat
- Reduced flow of water from the springs is the greatest threat to the survival of the San Marcos Salamander and other animals and plants dependent on the springs



©Photo courtesy Danal Tem

Texas Wild-rice (*Zizania texana*)

- Aquatic perennial grass found only in the upper two miles of the San Marcos River in central Texas
- Major threats include reduced springflow and invasive vegetation



© Photo courtesy Paul M. Montgomery

Fountain Darter

(*Etheostoma fonticola*)

- Lives only in the San Marcos and Comal River headwaters (where the rivers begin) in Hays and Comal counties, Texas.
- Most often found in mats of filamentous green algae.
- Adults occupy the quiet and flowing parts of the river, but the young stay mostly in slow-flowing backwater areas with lots of vegetation.



Photo courtesy Randy Gibson

San Marcos Gambusia (*Gambusia georgei*)

- This species is found only in the San Marcos River
- Last collected in the wild in 1983 - may already be extinct
- Reduced flow of water from the springs and water pollution are the major threats to the San Marcos Gambusia and other species dependent on the unique ecosystem of the San Marcos River
- Introduction of non-native species is also a threat because they may destroy aquatic vegetation, prey on endangered animals, or compete with them for food



Photograph by Bob Edwards

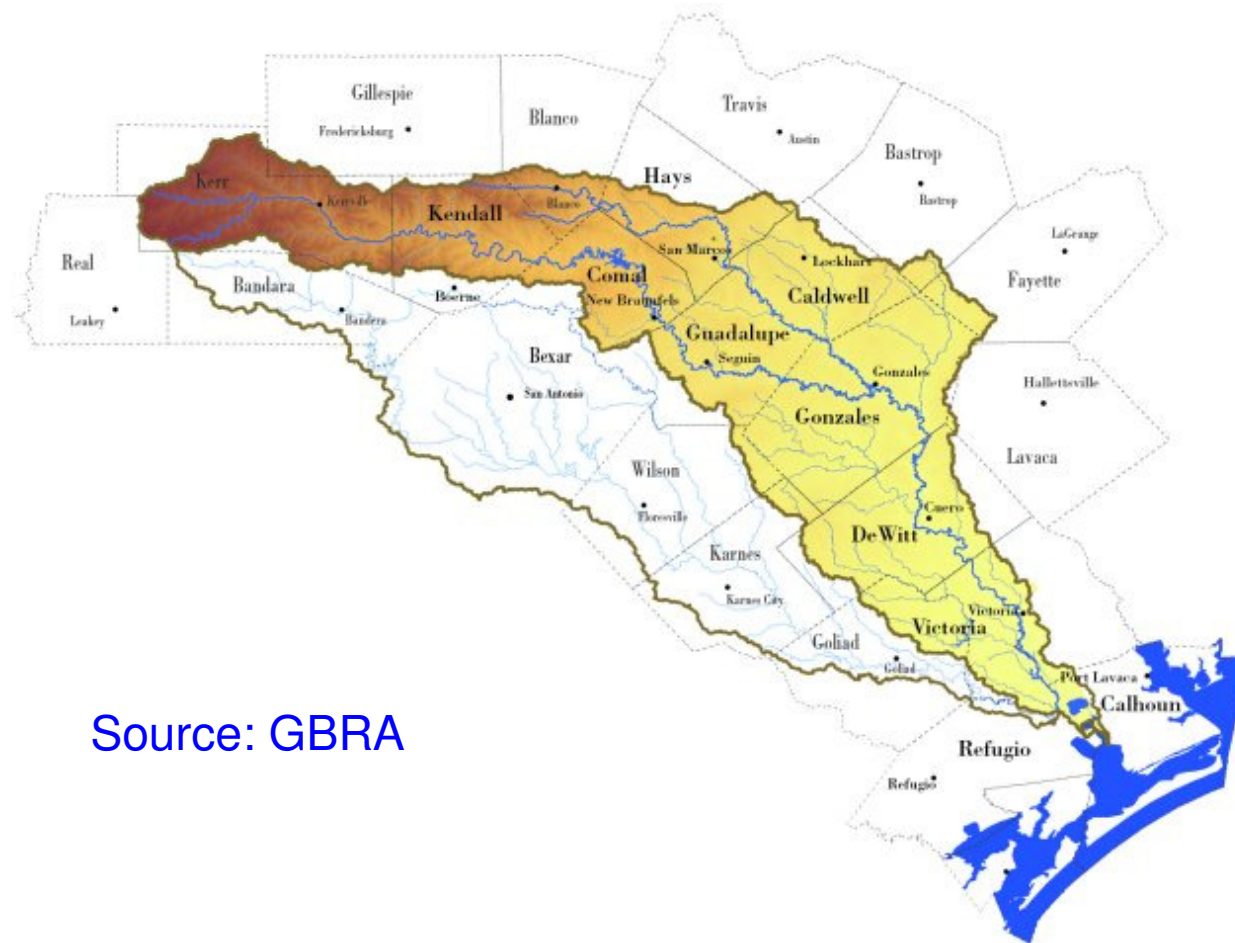
Comal riffle beetle, the Comal Springs dryopid beetle and the Peck's Cave amphipod

- U.S. Fish and Wildlife Service designated 10.5 acres around Spring Lake as “critical habitat”
- Threatened by the possibility of hazardous material spills, pesticides, storm water runoff and aquifer depletion
- Indicators of good water quality



Photos courtesy of Randy Gibson, USFWS

Guadalupe River and Estuary



Source: GBRA

Guadalupe River

- One of 15 major rivers in Texas
- Important recreational resource
- Provides water for cities, agriculture and industry
- Supports aquatic ecosystems including tidal marshes and bays



**Freshwater
Inflows...**

**Mix with
seawater to
create
salinity
gradients**

**Provide
nutrients,
sediments,
food, cover and
habitat**

**Maintain
important
habitats
like
wetlands**

**...By Definition
Create and Sustain
Estuaries**



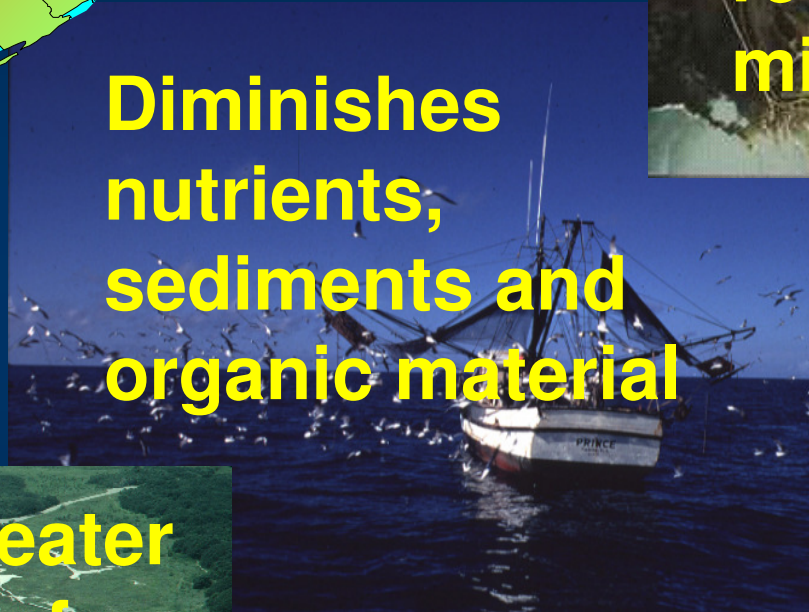
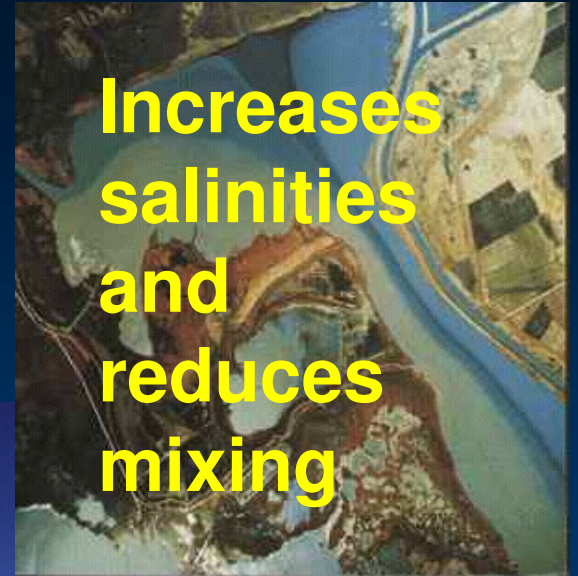
**Reduced Freshwater
Inflow...**

**Increases
salinities
and
reduces
mixing**

**Diminishes
nutrients,
sediments and
organic material**

**Allows greater
intrusion of
predators,
parasites
and diseases**

**...Changes the
Estuarine
Ecosystem**



Whooping Cranes

- At nearly 5 feet tall, whooping cranes are the tallest birds in North America and have a wingspan of 7.5 feet
- Whooping cranes winter on the Aransas National Wildlife Refuge's 22,500 acres of salt flats and marshes
- 217 Whoopers wintered at ANWR in 2006
- Blue Crabs , a major food source, depend upon freshwater inflows



Edwards Aquifer Recovery Implementation Program

- S.B. 3 established a process to ensure that the flows of the Comal Springs and the San Marcos Springs are protected during droughts
- SB 3 also raised Edwards Aquifer pumping limits from 450,000 to 572,000 acre-feet per year
- EAA with interested stakeholders and assistance of TAMU shall develop a Recovery Implementation Program through a facilitated, consensus-based process involving the USFWS
- The Recovery Implementation Program shall be developed for listed species under federal law and associated with the aquifer



Questions?

